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# DOES THE BUDGET DEFICIT CROWD-OUT PRIVATE CREDIT FROM THE BANKING SECTOR? THE CASE OF EGYPT\*

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**Abstract:** Driven by the observed growing budget deficit and the heavy reliance on debt-financing from the banking sector, this study sets to test the lazy banking hypothesis for Egypt. According to this hypothesis, government borrowing crowds out private investment through its dampening effect on private credit. The study estimates a VAR model using quarterly data spanning for almost four decades. The estimated model has unearthed a number of interesting results. As the government issues more debt instruments to finance its deficit, banks shift their portfolio away from risky private loans and opt for lazy behavior characterized by a shrinking overall credit tilted more and more toward government debt-instruments. This behavior not only limits their exposure to the private sector, hence reducing private investment, but also adversely affects investment and hence overall growth potential. In addition, evidence shows that output growth positively impacts the willingness of the banking sector to extend more credit to both the government and the private sector. Finally, and consistent with the lazy bank model, impulse response functions show that the effect of a government borrowing shock is contractionary (as opposed to the effect of private credit shock which is slightly expansionary) with regard to the overall banking sector credit.

**JEL Classification:** C32, E22, E62

**Keywords:** Lazy Banking Hypothesis, Vector Autoregressive Model, Crowding-Out Effect

\*An earlier version of this paper was drafted while the first author was working as economic consultant with the African Development Bank (ADB).

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## I. INTRODUCTION AND MOTIVATION

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The relationship between budget deficits and macroeconomic variables such as growth, interest rates, and private investment, among others, represents one of the most widely debated topics among economists and policymakers. Theoretical and empirical literature are not conclusive about the nature of some of the abovementioned relationships, but generally the method of financing government expenditures and the type of expenditure could play a significant role in shaping the relationship between the budget deficit on one side and investment and growth on the other side. In general, the key outcomes from the literature indicate that both the method of financing the deficit and the components of government expenditures could have different effects on private investment and growth<sup>1</sup>. In this study, we abstract from the level and decomposition of government expenditure and its effect on private investment and growth, and focus on the impact of the growing budget deficit and excessive government borrowing on private credit and investment in Egypt.

Governments in developing countries face significant constraints in raising revenues as the set of policy instruments available is limited given the rigid structure of expenditures and low level of income (Sah and Stiglitz, 1992; Fielding, 2007). With globalization, developing countries lost a historically reliable source of income from tariffs due to trade liberalization, but failed to recover the lost revenue by introducing tax reform in the form of a Value Added Tax (VAT). In addition, the reliance on inflation tax has gone down to maintain macroeconomic stability. The access to international credit markets' finance was also limited for most developing countries compared to developed countries. So the restricted sources of finance faced by governments in developing countries led them to borrow more from domestic markets and this borrowing has increased dramatically starting from the late 1990s (Emran and Farazi, 2009).

Crowding-out occurs when increased government borrowing reduces investment spending. Originally crowding-out was related to the increase in interest rates resulting from borrowing, but it was broadened lately to multiple channels that could leave total output little changed or even smaller (Blanchard, 2007). The available evidence, however, shows that the link between government borrowing and equilibrium interest rate (price channel) is very weak<sup>2</sup>. This relationship is expected to be even weaker in developing countries where the financial sector, especially the banking system, has historically been subject to extensive government interventions and the interest rates have often been set administratively by the central bank. If the interest rates are not determined by market clearing, then the availability of credit, the "quantity channel," would be more significant in understanding the effects of government borrowing on private investment rather than the "price channel."

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<sup>1</sup> Therefore, it is crucial to distinguish between current and capital expenditure when evaluating the impact of fiscal policy on private investment and output growth. Even though the overall results from the empirical literature with respect to the impact of public investment on private investment and growth are ambiguous, the bulk of the empirical studies find a significantly negative effect of public consumption expenditure on growth, while the effects of public investment expenditure are found to be positive although less robust (Saleh, 2003).

<sup>2</sup> Blanchard (2007) in his entry on "crowding-out" in the Palgrave Dictionary of Economics concludes: "... the effect of government debt on the interest rate; empirical evidence, from both across countries and from the last two centuries, shows surprisingly little relationship between the two."

When the government borrows one dollar from the domestic banking sector, how much does it reduce the credit to the private sector in a developing country? Or does it lead to more private credit (crowding-in)? Surprisingly, there is no reliable answer to these questions in the existing literature (Emran and Farazi, 2009). The relationship between government borrowing and private credit is usually thought of as negative. However, at least on the theoretical level, the relationship is not unambiguous. The degree of crowding-out depends on the nature of the endogenous response of the banks to a higher government borrowing and how they alter their balance sheets<sup>3</sup>. Banks respond to a higher government borrowing by adjusting their loan portfolio optimally given the risk-return characteristics of different assets and liabilities. There are alternative models of bank behavior in this regard. For example, a common argument is that when banks have excess liquidity, a higher lending to the government may not result in any significant reduction of credit to the private sector. Another argument is that access to safe government assets allows the banks to take more risk and thus increase their lending to the private sector; “risk diversification model”<sup>4</sup>. The alternative hypothesis which is referred to in the literature as the “lazy bank model” is that a high degree of lending to the government may create moral hazard and thus discourage the banks from lending to the risky private sector, and stifle their incentives to seek out new profitable investment opportunities in the private sector (Kumhof and Tanner, 2005; Emran and Farazi, 2009).

In Egypt, the public spending scheme is rigid and inflexible. It is mainly directed towards achieving social welfare through wages and subsidies that constitute more than 50% of total expenditures. Interest payments also represent a significant share of expenditures due to the high stock of public debt. In addition, public investment is treated as a residual. Egypt’s public finance conditions came under significant pressure with the political uprising in 2011. With rigid government spending and weak growth of revenues, the budget deficit widened recording 8.9% and 10.8% in 2011 and 2012 respectively, and fiscal imbalances exacerbated as concerns about inequity and rising pressures for the most vulnerable groups have forced the adoption of an expansionary fiscal policy.

The cautious stance adopted by foreign investors towards Egypt’s debt market coupled with the increased issuance of debt papers by the government to finance the widening budget deficit motivated banks to increase their holdings of government securities as they offered higher yields relative to the pre-revolution levels. On the other hand, subdued credit growth to the private sector could be attributed to the slowdown in economic activity as well as domestic bank reluctance to engage in further lending activities to the private sector in an attempt to make their balance sheets as liquid as possible. Borrowing from the domestic market at a higher rate than that in the international market places an additional burden on the budget and creates the potential for the private sector to be squeezed out from receiving available funds. Extending domestic borrowing would probably have serious long-term implications (Kandil 2011; Emam

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<sup>3</sup>*Ceteris paribus*, if the government borrows one dollar more from the banking sector, banks are left with one dollar less for the private sector.

<sup>4</sup> Such an endogenous response by banks will tend to “crowd-in” private credit or at least partially offset the traditional crowding-out effect. This would in general result in a smaller than one crowding-out coefficient in absolute value, and may even result in a positive coefficient on government borrowing if the risk diversification effect is strong enough.

2012; Fayed 2012) given the escalating domestic debt which registered an increase of 19.6% in 2011 over 2010 in absolute figures amounting to 76.2% of GDP and an increase of 18.5% in 2012 over 2011 amounting to 80.3% of GDP. The IMF (2005b) confirms that implementing a multi-year strategy of fiscal consolidation in Egypt that lowers total government borrowing and places public debt on a firmly declining path would be crucial to achieving a robust response for private investment and growth.

In this study, we investigate the presence of crowding-out effect of government borrowing from domestic banking on the private sector (quantity approach) given the empirical insensitivity of investment to interest rates. More precisely, the study helps understand the “additional costs” of financing government expenditure through domestic borrowing and determines if the banking sector is populated by lazy banks.

The rest of the study is structured as follows: Section 2 highlights the fiscal imbalances in Egypt and the exacerbating budget deficit that leads to excessive government borrowing and the potential impact of the latter on private investment. Section 3 gives a comprehensive overview of the theoretical and empirical literature pertaining to the crowding-out effect of the budget deficit. Section 4 presents the methodology for examining the quantity channel of the crowding-out effect of government borrowing and assesses the lazy bank hypothesis. Section 5 reports the results of the empirical analysis and section 6 concludes the study and provides policy implications for Egypt.

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## **I. EGYPT FISCAL IMBALANCES, GOVERNMENT BORROWING AND PRIVATE INVESTMENT**

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The management of public finance in Egypt was challenging though a gradual adjustment was put underway. In the early 2000s, the budget deficit was double digits (reaching 10.4% in FY03). Public debt was also very high, with the general government debt reaching 117% of GDP. By the middle of the decade, both the public deficit and debt started to slowly decline, reaching 6.8% and 7.8% in 2007-08, respectively.

The political turmoil which started with the onset of 25<sup>th</sup> of January revolution undermined confidence in the Egyptian economy and significantly affected economic growth, which negatively impacted the revenue side of the government (see Figure (1)). With rigid government spending and stagnant revenues, the budget deficit widened and fiscal imbalances were exacerbated. The fiscal policy remained supportive to social welfare areas of spending, with additional socially geared public spending announced by the government. Subsidies and wages accelerated significantly in 2010/11 by 19.6 % and 12.8 %, respectively<sup>5</sup> (Kandil, 2011; MoF Financial Monthly, 2011).

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<sup>5</sup> It is notable that the unfavorable rise in global food and energy prices as well as the depreciation of the domestic currency added more pressure to the subsidy bill.

## **A. Fiscal Deficit**

What is observed in terms of a dangerously high government deficit, reaching 10.8% of GDP in FY2011/2012 (Ministry of Finance 2013), is the symptom of an inefficient tax system and public expenditure scheme. Ironically, with their current structure, the tax system and public expenditure scheme would fail to meet the aspirations of the 25<sup>th</sup> of January Revolution in terms of social justice and a better standard of living for the bulk of the Egyptian population.

In terms of public spending, figure (2) highlights the main components of the Egyptian government budget and demonstrates the low rank of public investment in the budget. A few fundamental problems render public spending inefficient with little long-term relevance and vision. First, a costly, yet inefficient, subsidy scheme, covering mainly fuel and food products, eats up nearly 25% of public expenditures. The subsidy bill reached EGP150 billion in FY2011/2012, representing 32% of total government expenditures and 9.7% of GDP (MoF Financial Monthly, 2013). The subsidy bill is increasing with the population growth and the recent upward trend in the world primary commodities prices. This current subsidy system is extremely inefficient because of excessive waste and an untargeted delivery system. Figure (3) illustrates the trend of the subsidy bill during the last 10 years.

Second, public investment, the most important component of public expenditure, which should be complementary to private investment and a catalyst to economic growth, is often treated as a residual. It is observed that there has been a tradeoff between public and private investment since the 1990s (Figure 4). This, combined with the high volatility of public investment, in real terms adversely affected growth and the effectiveness of public services (Figure 5).

Third, key sectors, such as education and health, which are directly related to human capital and poverty alleviation, are not getting enough attention from policymakers in Egypt. According to the Central Agency for Public Mobilization and Statistics (CAPMAS, 2010/2011), 25% of the Egyptian population live under the national poverty line<sup>6</sup>. The shares of health and education of GDP are quite diminutive, even compared to similar developing countries. These shares are incompatible with inclusive growth and social justice, which should top policymakers' agenda, especially after the 25<sup>th</sup> of January Revolution.

## **B. Financing the Deficit: Government Borrowing and the Credit to the Private Sector**

The slowdown in growth of public revenues coupled with the significant increase in public spending since the revolution began in January 2011 led to a sharp widening in the overall budget deficit to GDP to reach 9.8 % in 2010/11, and 10.8 % in 2011/2012. To finance this widening budget deficit, the government depended mainly on domestic sources of finance; the CBE, the banking sector and other non-bank institutions like the National Investment Bank (NIB) and Social Insurance Funds. Interest payments increased to 17.6 % due to increasing the supply of government debt papers to finance the broadening deficit as well as the higher cost of borrowing as a response to the downgrading of Egypt's sovereign rating (Emam, 2012)<sup>7</sup>.

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<sup>6</sup> The national poverty line is estimated to be EGP256 per month (CAPMAS, 2010/2011).

<sup>7</sup> The benchmark interest rate in Egypt was last recorded at 9.75 percent. Historically, from 1991 until 2013, Egypt interest rate averaged 11.70 % reaching an all-time high of 21.40 % in October of 1991 and a record low of 8.25 %

Excessive domestic government borrowing led to an increase in public debt to 80.6% of GDP in 2012, from 76.2% of GDP a year earlier<sup>8</sup>.

Generally, the domestic sector used to fund more than 80% of the government's fiscal shortfalls, yet, banking finance augmented notably in 2010/11 to substitute for the reduction in non-banking finance. Domestic credit growth accelerated significantly in 2011, growing at an annual rate of 22.65% compared to 7.8% in 2010. This trend prevailed in 2012 with the absence of significant foreign participation in local debt markets. This motivated domestic banks to increase their holdings of government securities. The balance sheets of the banking sector show a growing government size: the banks' total claims on the government increased their share within total bank claims from 30% in June 2008 to 49% in June 2011; the share of claims in local currency is even more significant, reaching 60% by June 2011. This increase is driven mostly by investment in government securities and T-bills growing by 28% between December 2010 and 2011. On the other hand, the private sector's share in total bank claims fell from 65% in June 2008 to 47% in June 2011 (World Bank, 2013). The subdued credit growth to the private sector was due to the slowdown in economic activity as well as domestic bank reluctance to engage in further lending activities to the private sector in an attempt to maintain their balance sheets as liquid as possible (Fayed, 2012; CBE Monthly Bulletin, 2012). The banking sector's claims on the government and on the private sector as a percentage of GDP show divergent trends, especially since 2009 (Figure 6). This simple time series plot seems to indicate that there is a very strong negative correlation between government borrowing and private credit; however, a more detailed econometric analysis is needed to precisely assess this negative relationship. Also, assessing the banks' lending capacity<sup>9</sup>, figure 7 shows that the growth rate of banks' lending capacity has continuously surpassed that of total loans in Egypt. This is a case where the banking sector could be populated by "Lazy banks."

In a nutshell it is clear that the current stance of public expenditures, and its expected near future trend, is unsustainable, or at best bears high long term social and economic costs. In addition, borrowing from the domestic market at a higher rate than that in the international market places an additional burden on the budget and creates the potential for the private sector to be squeezed out from receiving available funds. World Bank (2013) indicates that in spite of the contracting demand for credit in the current recessionary period, credit to the government provides an alternative use of funds to the banking sector that accounts for the major part in the decline of credit to the private sector. Hence fiscal adjustment will imply credit flowing back to the private sector. Given the importance of the private sector in this critical time for Egypt, much needs to be done in order to facilitate access to credit and hence boost economic growth. Hence, in light of the tightening budget constraints caused by the rigid expenditure structure and the stagnant revenues after the revolution, it has become increasingly important to investigate if the debt-

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in September of 2009. In Egypt, decisions on interest rates are made by the CBE whose official rate is the overnight deposit rate. So interest rates are set administratively by the central bank.

<sup>8</sup> External debt remains manageable though, dropping to 13% of GDP in 2012, from 15.2% in 2011.

<sup>9</sup> The lending capacity is defined as total liabilities less reserves, cash in vault, and capital.

financed deficit crowds-out the most needed private investment and to explore which portfolio of public expenditure generates economic growth in Egypt. The former is investigated in this study, whereas the latter is an area for future research.

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## I. LITERATURE REVIEW

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The literature review section provides an overview on the theoretical and empirical literature regarding the effect of the budget deficit on private investment. It focuses on the crowding-out effect of the deficit on private investment. The structure of the literature review follows the two channels through which debt financed deficit affects private investment, mainly the price channel and the quantity channel. The former examines how government debt financing affects the interest rate and hence private investment; whereas the latter looks at how the volume of credit is altered with government reliance on debt financing. As explained in the previous section, this study focuses on the latter channel given the insensitivity of investment to the interest rate, especially in developing countries. It should be noted that most of the empirical literature presented in this section deals with developed countries given the paucity of research focusing on developing countries.

In fact, there is extensive literature on the relationship between the budget deficit and investment. Economic analysis of the aggregate effects of fiscal policy dates back at least to the work of David Ricardo. Modern academic interest was reinvigorated by the work of Barro (1974) and by the emergence of large U.S. federal budget deficits in the 1980s and early 1990s. The rapid but short-lived transition to budget surpluses in the late 1990s, followed by the sharp reversal in budget outcomes since 2000, has raised interest in this topic again. Despite this long history, the effect of the government deficit and its method of financing on the economy are not obvious from either economic theory or empirical evidence (Gale and Orszag 2004).

### A. Budget Deficits, Crowding-In and Crowding-Out Effects: Theoretical Debates

The theoretical literature on the topic shows that the views on the validity of the crowding-out or crowding-in hypothesis are varied. Generally, economists tend to view the aggregate effects of the fiscal policy from one of three perspectives. While the neoclassical school advocates crowding-out, the Keynesian model argues that an increase in government spending stimulates the domestic economic activity and crowds-in private investment; the Ricardian Equivalence Theorem states that increases in the deficit financed by fiscal spending will be matched with a future increase in taxes, and so they leave interest rates and private investment unchanged (Bahmani-Oskooee, 1999).

The Neoclassical Loanable Funds Theory explains that the balancing of savings and investment is achieved by the interest rate mechanism. The malfunctioning or slow operation of this mechanism are attributed to the short-term variations in employment and output <sup>10</sup>(Grieve, 2004). In case of an increase in government spending, interest rates have to increase to bring the capital market into equilibrium, dampening private investment (Heijdra and Ligthard, 1997; Voss, 2002; and Ganelli, 2003).

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<sup>10</sup> If labor supply is inelastic, output is fixed; any increase in aggregate demand caused by the increased government spending will be offset by an increase in interest rates, leaving output unchanged (Blanchard, 2007).



The Keynesian view, on the other hand, assumes that there is usually unemployment in the economy and that the interest rate sensitivity of investment is low. In that case, expansionary fiscal policy will lead to little or no increases in the interest rate and an increase in output and income<sup>11</sup>. In addition, this view assumes that government spending increases private investment due to the positive effect of government spending on investors' expectations. Therefore, there is crowding-in rather than crowding-out (Aschauer, 1989b; Baldacci, et al., 2004). Many traditional Keynesians argue that deficits need not crowd out private investment. Eisner (1984) is an example of this group, who suggests that increased aggregate demand enhances the profitability of private investments and leads to a higher level of investment at any given rate of interest.

Inspired by the work of Barro (1991), a number of studies have argued that certain type of public spending such as public investment could be conducive to private investment and growth. As indicated by Saleh (2003), it is argued that public capital crowds out or crowds in private capital, depending on the relative strength of two opposing forces: (1) as a substitute in production for private capital, public capital tends to crowd out private capital; and (2) by raising the return to private capital, public capital tends to crowd in private capital. Furthermore, Aschauer (1989a, 1989b) argues, on the one hand, that higher public investment raises the national rate of capital accumulation above the level chosen (in a presumed rational fashion) by private sector agents; therefore, public capital spending may crowd out private expenditures on capital goods on an ex ante basis as individuals seek to re-establish an optimal intertemporal allocation of resources. On the other hand, public capital, particularly infrastructure capital such as highways, water systems, sewers, and airports, are likely to bear a complementary relationship with private capital. Hence, higher public investment may raise the marginal productivity of private capital and, thereby, "crowd-in" private investment.

Finally, there is the Ricardian Equivalence Theorem proposed by Barro (1974), which assumes that asset holders completely discount future tax liabilities implied in the deficits. This implies that budget deficits are irrelevant for financial decisions. In other words, a deficit induced by a lump-sum tax cut today followed by a lump-sum tax increase in the future will be fully offset by an increase in private saving, as taxpayers recognize that the tax is merely postponed, not canceled. The offsetting increase in private saving means that the deficit would have no effect on national saving, interest rates, exchange rates, future domestic production, or future national income (Gale and Orszag 2004).

The effect of the method of financing the deficit on private investment and growth has been tackled in the literature; for example Premchand (1984) asserts that financing the budget deficit by borrowing from the public implies an increase in the supply of government bonds. In order to improve the attractiveness of these bonds the government offers them at a lower price, which leads to higher interest rates. The increase in interest rates discourages the issue of private bonds, private investment, and private spending. In turn, this contributes to the financial crowding out of

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<sup>11</sup> If the pressure on interest rates happens, it does not come from the full employment constraint as in the neoclassical view, but from the increased demand for money from increased output. Thus the fiscal multiplier is smaller the lower the elasticity of money demand to interest rates, or the larger the elasticity of private spending to interest rates. Fiscal expansion crowds out the interest-sensitive components of private spending, but the multiplier effect of output is positive (Blanchard, 2007).

the private sector (price channel). Heng (1997) utilized an overlapping-generations (OLG) model to provide a theoretical framework to analyze the “crowding-in” issue of private capital by public capital. He shows that public capital crowds in private capital through two channels, namely, via its impact on the marginal productivity of labor and savings, and via (gross) complementarity/substitutability between public and private capital.

#### **B. Budget Deficits, Crowding-out and Crowding in Effects: A Holistic Approach**

A number of empirical studies have attempted to study the link between the budget deficit from one side and a host of macroeconomic variables such as growth and private investment from the other side. These studies have taken a holistic approach as they did not care about the channels through which the deficit would affect these variables. Nevertheless, it is important to review the main studies in this strand of the literature.

Guess and Koford (1984) used Granger causality to find the causal relationship between budget deficits and inflation, GNP, and private investment using annual data for seventeen OECD countries for the period 1949 to 1981. They concluded that budget deficits do not cause changes in these variables. Using annual data for the US over the period 1953-1986, Aschauer (1989b) empirically examined the effect of public expenditure on private investment and the rate of return to private capital. He concluded that public investment might be thought to raise private investment as the former raises the profitability of private capital stock, which means that government investment had a positive effect on private investment and caused “crowding-in” rather than “crowding-out”.

Barro (1990; 1991) utilized endogenous-growth models to assess the effect of public investment and consumption expenditures on growth, and extended the models to demonstrate the effect of the method on financing the deficit on production and utility. He studied the effects of tax financed government expenditure on investment and output in a cross-sectional study of 98 countries over the period 1960-85. He found that the ratio of real government consumption expenditure to real GDP had a negative association with growth and investment. The argument was that government consumption had no direct effect on private productivity, but lowered savings and growth through the distorting effects from taxation or government-expenditures programs. It is worth noting that the distinction between productive and unproductive government services provides vital information for an analysis of the effects of the government budget on capital formation and growth.

Miller and Russek (1997) consider a sample of developed and developing countries from 1975 to 1984. They find that both the method of financing and the component of government expenditure can have different effects. Debt-financed increases in defense, health, social security and welfare expenditures negatively affects the growth of real per capita GDP in developing countries, while debt-financed increases in education expenditures positively affected growth in developed countries. Ghali (1997) investigated the relationship between government spending and economic growth in Saudi Arabia using annual data over the period 1960-1996. The study found no consistent evidence that changes in government spending have an impact on per capita real output growth. Ghali and Al-shamsi (1997) have utilized cointegration analysis and Granger-causality to investigate the effects of fiscal policy on economic growth for the United Arab Emirates over the period 1973-1995. They decomposed public spending into consumption and

investment expenditures, and provided evidence that government investment has a positive effect on economic growth, whereas the effect of government consumption is insignificant.

Monadjemi and Huh (1998) utilized an error correction model (ECM) model to examine the relationship between private investment and government spending in Australia, UK, and the US over the period 1970-1991. Empirical results provide limited support for “crowding-out” effects of government investment on private investment. The rate of interest and corporate profitability showed significant effects on private investment in two out of three countries. Bahmani-Oskooee (1999) investigated the long-run relationship between U.S. federal real budget deficits and real fixed investment using quarterly data over the 1947-1992 period. The methodology in this study is based on the Johansen-Juselius cointegration technique. Their empirical results indicated that real budget deficits have crowded in real investment, supporting the Keynesians who argue for the expansionary effects of budget deficits, which by raising the level of domestic economic activity “crowd- in” private investment.

From the above studies, one can conclude that the empirical literature with respect to the impact of budget deficit on private investment and growth is ambiguous, but the bulk of the empirical literature finds a significantly negative effect of public consumption expenditure on growth, while the effects of public investment expenditure are found to be positive although less robust.

### **C. Budget Deficits and Interest Rates (Price Approach): Empirical Studies**

As discussed earlier in the literature review, there are two conflicting views regarding the effect of government budget deficits on interest rates. The Keynesian models and neoclassical models represent the standard analysis, where the impact of increased deficits on interest rates operates through the effects of higher spending and increased wealth on the demand for money. In the Ricardian model, however, the value of the new debt is simply perceived as the present value of the future tax liabilities. This means that the government debt is not viewed as net wealth and, as a result, money demand would not be affected. Consequently, interest rates remain unchanged as well (Saleh, 2003). It is worth noting that almost all of the cited empirical studies have taken developed countries as their samples.

Dwyer (1982), Makin (1983), Hoelscher (1983), Kormendi (1983), Aschauer (1985), Evans (1985; 1987a; 1987b), Monadjemi (1989), Darrat (1989; 1990), and Findlay (1990) have provided empirical evidence suggesting that government budget deficits have no significant effect on interest rates. In contrast, Feldstein (1982), Hutchison and Pyle (1984), Tanzi (1985), Hoelscher (1986), Tran and Swahney (1988), Wachtel and Young (1987), Kolluri and Giannaros (1987), Zahid (1988), and Liargovas et al. (1997) have found that large government budget deficits cause high interest rates. Furthermore, several researchers have attempted to find an association between nominal interest rates and the U.S. deficit using post-war data, such as Feldstein and Eckstein (1970), Hoelscher (1986), and Cebula (1988; 1991), who show that federal deficits have a positive effect on nominal long-term interest rates, cause the slope of the yield curve to increase, and crowd out private investment. Bernheim (1987; 1989) argues that the Ricardian equivalence hypothesis does not hold. On the other hand, Carroll and Summers (1987) find evidence to support the Ricardian equivalence hypothesis and report that there is a one-to-one link between the government deficit and private saving.

Knot and de Haan (1999) examine the relationship between budget deficits and interest rates in Germany over the period 1987-93. Their results suggested that the positive relationship between

budget deficits and interest rates is due to fear that government debt may crowd out private investment. Ewing and Yanochik (1999) examined the impact of federal budget deficits on the term structure of interest rates in Italy over the period 1977-1991. Using the cointegration technique, this study suggested that budget deficits increase the yield spread between long-term government bonds and the three-month Treasury bill rate<sup>12</sup>. This finding suggests that budget deficits may hinder long-term economic growth in Italy, via the crowding out effect, by increasing long term interest rates relative to short-term interest rates.

Vamvoukas (2000) examined the linkage between budget deficits and interest rates in Greece over the time periods 1949-1994, 1953-1994 and 1957-1994. With an ECM strategy, the empirical findings support the Keynesian model of a significant and positive relationship between budget deficits and interest rates. Modeste (2000) utilized the loanable funds model of interest rate determination to investigate the relationship between budget deficits and interest rate movements. A basic tenet of that model is that interest rates would rise (fall) as economic forces either increase (decrease) the demand for loanable funds or reduce (increase) the supply of such funds. The study applies loanable funds framework and error correction on Jamaican data over the period 1964-1996. This study has found that the government's budget deficits have exerted a significant positive effect on the long-term interest rate. Adding to this result, a major implication of this study is that budget deficits, to the extent that they force up interest rates, can cause "crowding-out" of private investment.

#### **D. Budget Deficits, Volume of Credit (Quantity Approach): Empirical Studies**

So far, it appears that the empirical literature in the context of developed countries focuses mainly on the effects of government debt on the equilibrium interest rate, but the findings are inconclusive. The available evidence, however, shows that the link between government borrowing and the equilibrium interest rate is very weak at best. There are many reasons to expect that this relationship is even weaker in developing countries. First, the financial sector, especially the banking sector, has historically been subject to extensive government interventions and the interest rates has often been set by the central bank; the intervention is still very significant even though financial liberalization has been implemented in many countries. Second, even if the banking sector is fully liberalized, the effects of government borrowing on private investment in the developing countries might still be mediated primarily through the credit availability, given that the credit market markets are less developed and credit rationing might be more prevalent<sup>13</sup>. If the interest rates are not determined by the market clearing, then the "availability of credit" (quantity approach) is more important in understanding the effects of government borrowing on private investment especially in developing countries.

The empirical literature investigating the quantity approach is rather thin in general and even thinner in the case of Egypt. By focusing on the volume of private credit, Emran and Farazi (2009) explored the crowding-out of private investment in developing countries. The study measures the casual effect of government borrowing on private credit using panel data on 60 developing countries for 32 years. The estimates indicate that \$1.00 more of borrowing by

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<sup>12</sup> These results are consistent with those of Cebula (1991) who found that US deficits exhibit a significant effect upon the term structure of interest rates.

<sup>13</sup> See Emran and Farazi (2009) for a more detailed list of references on the topic.

government reduces private credit by \$1.40, which is generally consistent with a “lazy bank” model of bank behavior in developing countries<sup>14</sup>.

The literature on Egypt regarding the effect of the budget deficit on private investment is almost nonexistent. Morley and Perdakis (2000) investigated the combined effects of growth in government expenditures, exports, investment and labor supply on economic growth in Egypt between 1995 and 1996. Using cointegration and error correction models, the study finds a long-term relationship between the variables, but less evidence of one in the short term.

Abdel-Kader (2006) conducted a survey of some state owned and private banks and 351 firms from various sectors in Egypt. The study investigated the extent of credit decline to the private sector in Egypt and whether it is due to supply factors (credit crunch), demand factors (credit slowdown), or other factors (e.g., crowding out). The study found that interest rates are no longer the decisive factor in lending decisions. In addition, due to the problem of non-performing loans, banks were becoming more risk-averse, as reflected by the reduction in private credit and investment in more liquid and less risky assets, such as treasury bills and government bonds. Consequently, Egypt was experiencing a credit crunch.

Fayed (2012) investigated the relationship between government borrowing and private credit in Egypt using quarterly data spanning from 1998 to 2010 and a cointegration approach, and concluded that government borrowing from domestic banks leads to more than a one to one crowding out of private credit. The study utilized the Emran and Farazi (2009) model but removed some control variables from the original model that only varied cross-sectionally. However, the study suffers from a number of critical drawbacks. First, the study included as a control variable the regulatory quality indicator<sup>15</sup>, which is a proxy for the rule of law. The problem is that this variable has an annual frequency and is not available on a quarterly basis; moreover, according to the World Bank, such variables have a very low degree of variability even on an annual basis. Second, the study uses industrial production as a proxy for GDP; however, industrial production is an ill proxy for GDP since industry sector is only one sector of the economy and its share is by all means not a dominant one especially in the case of Egypt. In addition, the ratios of government borrowing and private credit to industrial production make no or very little economic sense. Actually, this wrong choice of the proxy for GDP was reflected on the property of these ratios which were found to be nonstationary as opposed to the ratios of government borrowing and private credit to GDP which are stationary by definition.

Recently, World Bank (2013) shows that the rise of commercial bank credit to the government during the recent capital outflow episode after 2011 was coupled by an accelerated decline in the fraction of credit to the private sector. The study finds that the economic slowdown accounts for between 15 and 20% of the predicted total fall in credit, while the expansion of credit to the

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<sup>14</sup> We are not aware of any other studies that provide estimates of crowding out of private credit -except this one- that can be used as benchmark for our estimates. From a regression of private lending on domestic debt for 27 countries, Christensen (2005) find that a 1% increase in domestic debt relative to broad money reduces private lending (relative to broad money) by 0.15 %. Temin and Voth (2005) report an estimated crowding out coefficient of -0.20 to -0.34 for 18<sup>th</sup> and 19<sup>th</sup> century England. There are a number of recent studies that analyze the effect of domestic debt, but their focus is on growth (for example, Abbas and Christensen, 2007)

<sup>15</sup> This indicator is reported by the World Bank in its Worldwide Governance Indicators (WGI) database.

government accounts for the remaining fraction. This serious finding implies that extending domestic borrowing could probably have serious short-term as well as long-term implications.

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## II. METHODOLOGY

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The empirical model we use is inspired by the work of Emran and Farazi, (2009); however, the main difference is that Emran and Farazi's study is a cross-country one whereas this one is a single country study. The above mentioned study has used panel data which exploits cross-section as well as time series variations to gauge the effect of government debt financing on private credit after controlling for a host of variables taking into account primarily cross country heterogeneity. As is the case in almost all panel data models, the obtained point estimates in Emran and Farazi, (2009) measure the "average" effect of government debt financing on private credit for countries included in the sample. These point estimates cannot be readily extended to individual countries. Hence, if one is interested in a specific country then these panel data models would not be of great help.

Given our interest in the case of Egypt, we must turn to time series data with high frequency in order to have enough degrees of freedom to obtain more efficient estimates. We use quarterly data spanning from the first quarter of 1970 until the second quarter of 2009. Data is obtained from IFS online database maintained by the IMF. Using time series data invariably requires that we use an appropriate time series technique. We use a Vector Autoregressive (VAR) as our empirical model. There are mainly two reasons for choosing VAR. First, the two principle variables private credit and government credit are potentially endogenous variables. Hence, using VAR framework would take into account this potential endogeneity. Second, casting the empirical model into a dynamic VAR specification would enable us to portend how these variables respond to shocks via analyzing impulse response functions. Obviously, of central importance is the response of private credit to change in government debt financing. These impulse response functions would give a dynamic response of the endogenous variables to changes in the VAR system. Hence, one can observe the evolution of the variables over time, which gives more food for thought when it comes to applied analysis and policy implications.

The empirical model can be expressed as follows:

$$Y_t = \sum_{j=1}^p A_j Y_{t-j} + GO_{t-j} + u_t \quad (1)$$

Where  $Y_t$  is the vector of endogenous variables which includes Private Credit (PC) and Government Borrowing (GB), denoting private credit as a ratio of GDP and government borrowing as a ratio of GDP, respectively.  $p$  represents the lag order which is chosen to minimize some known information criteria. Similar to Emran and Farazi, (2009), the growth rate of GDP (GO) appears as an explanatory variable<sup>16</sup>. However, to avoid the possible endogeneity problem and to be consistent with the dynamic specification of the VAR system, GO appears in

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<sup>16</sup> Other potential explanatory variables were tried mainly a measure of interest rate (discount rate) and the level of financial intermediation (sum of demand and time deposits); however, they turned out to be completely insignificant.

the equations in the form of distributed lags taking the same order as  $p$ . Finally,  $u_t$  is an *iid* error term matrix with a symmetric and positive definite variance-covariance matrix.

As noted above, the source of the data is IFS. For both private credit and government borrowing, the data is readily available in quarterly frequency. However, GDP is only available in annual frequency<sup>17</sup>. In order obtain a quarterly series for GDP an iterative factor analysis technique was used to estimate quarterly GDP figures using the information set of available quarterly data in Egypt.

To implement impulse response functions (IRF), Cholesky decomposition was used to model the contemporaneous correlations among the components of  $u_t$ . Guided by economic intuition, these are assumed to take the following forms:

$$u_{t,GB} = v_{t,GB}$$

$$u_{t,PC} = v_{t,PC} + w_{PC,GB} v_{t,GB}$$

According to this specification, a shock to GB affects its own current value as well as the value of the PC; whereas a shock to PC affects only its current value. This specification implicitly assumes some kind of “exogeneity ranking” of endogenous variables. Government borrowing is a variable which is to a large extent controlled by the government as opposed to private credit. Consequently, innovation in government borrowing has a contemporaneous effect on both its own value and on the one of private credit; in contrast to the innovation in private credit which only affects its own value.

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### III. ESTIMATION AND RESULTS

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Before the VAR system is estimated, it is imperative to check the stationarity of included variables as well as determining the optimal lag. According to the Augmented Dicky-Fuller (ADF) test, all variables appear to be stationary (see Table 1). This is an expected result given the definition of the included variables which are either the ratio of GDP or the growth rate. The last step before estimating (1) is to determine the optimal lag  $p$  after performing a grid search using three information criteria: Akaike information criterion (AIC), Schwartz Bayesian criterion (BIC) and Hannan-Quinn criterion (HQC). Both AIC and HQC indicated that the optimal lag is 6 where these criteria are minimized<sup>18</sup>. Hence the VAR system as depicted in (1) was estimated with  $p$  equals 6.

Table (2) depicts the estimated coefficients together with their corresponding  $p$ -values as well as key diagnostic statistics. For the first equation of government borrowing, from the diagnostic statistics (R-squared, adjusted R-squared and F-statistic) one can notice that the VAR system was successful in explaining well the variation in government borrowing where more than 60% of the variation was explained by the lagged endogenous variables together with the lagged real growth

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<sup>17</sup> There are a very short series of quarterly GDP figures maintained by the Ministry of Planning; however, this series cannot be used due to its limited span.

<sup>18</sup> It is not uncommon that different information criteria give different optimal lags. This is why three information criteria were used, aiming that at least two information criteria give the same result, which was exactly the case.

rate in output. In addition, the F-statistic points to the overall significance of the whole equation with almost 100% significance level.

Turning to the estimated coefficients, few coefficients appear to be significant, mainly the sixth lag of the government borrowing, the first lag of private credit and the fifth lag of the real growth in output. The sign of the sixth lag of government borrowing is negative, indicating that as government borrowing increases the willingness of the banking sector to extend funds to the government is hampered, but such effect happens with significant lag (after approximately two years). The sign of first lag of private credit is positive, pointing to the inclination of the banking sector to increase their holding of government debt when there is an increase in private credit. A possible justification behind such a result is that when the banking sector extends more credit to the private sector, it tries to balance its portfolio right away by increasing its holding of the relatively safer government debt. Lastly, the positive sign of the fifth lag of the real growth in output indicates that improvement in fundamentals and the overall economic conditions are reflected positively on the willingness of the banking sector to extend more credit to the government. This is intuitive as a healthy macroeconomic stance is reflected positively on the creditworthiness of the government, enticing banks to increase their holding of government debt. It is worthy to note that the magnitude of the estimated coefficient is very high (approximately 8.7) which means that banks are very sensitive in terms of expanding their holding of government debt to real improvement in the macroeconomy.

As for the second equation explaining the variation in private credit, the diagnostic statics point to the success of the VAR system in capturing a big share of the variation in the private credit variable. Again, approximately 60% of the variation in private credit is explained by the lagged endogenous variables and the lagged real growth in output. The F-statistic indicates the high overall significance of the estimated equation (almost 100% significant).

Moving to the estimated coefficients, one can notice that few of them turned out to be significant which are the first and sixth lags of government borrowing, the first lag of private credit and the sixth lag of real output growth. The signs of both the first and the sixth lag of government borrowing are negative. This, together with the magnitude of the estimated coefficients (1.8 and 1.6 respectively), is a strong indication that as banks increase their holding of government debt, their appetite for private credit is significantly adversely affected by a factor exceeding one. This result is consistent with the lazy bank hypothesis. The sign of the first lag of private credit is positive and economically quite significant, with its magnitude of 3.2 indicating that private credit is highly autoregressive. A possible explanation behind this result is that as some banks extend more credit to the private sector, this, through the process of competition and increasing confidence in the private sector, pushes more banks to do the same, hence raising banks' overall private credit with a geometric ratio. Lastly, the sign of the sixth lag of real growth in output is positive, indicating that banks grant more credit to the private sector when the level of economic activity rises. Interestingly, not only does the sixth lag of real output growth affect both government borrowing and private credit, but also the magnitude of the effect is almost the same for both endogenous variables. Intuitively, this makes lots of sense. As the stance of the macroeconomy improves, banks are encouraged by this upbeat trend to react favorably by extending more credit to both the private and the government sector, albeit the increase for the latter is slightly more than the former.



One of the main advantages of the VAR model is its ability to trace the effect of shocks in the endogenous variables over time through impulse response functions (IRF). Figure (8) depicts the dynamic responses of a one-standard error shock in government borrowing and a one-standard error shock in private credit, whereas Table (3) provides the numerical values of the effect of each shock separately over 20 quarters. The first interesting observation, which is common in the four graphical representations of IRF, is that they are all explosive, which means that the effect of the shock does not die over time, but it propagates over time with higher fluctuations into the future. This is evidence that the financial sector, or more precisely the banking sector, has an inherent instability in the face of shocks. This result is not surprising since from the onset of the emergence of the modern banking sector, it has been observed that it is prone to crises since each bank pursuing its profit maximization motive usually does not take into account its effect on other banks and on the macroeconomy in general, which has made the supervisory and the regulatory function of the central bank of momentous importance to ensure the stability of the financial sector. The second observation pertaining to all IRF is the observed oscillations as a result of shocks. In all IRF, endogenous variables' responses tend to oscillate between positive and negative values; still it is possible to deduce if the "sum" of the overall responses is positive or negative. This apparent wavering could be attributed to banks' lingering attempt to balance their portfolio in the face of shocks.

There is an important difference between the response of a one-standard error shock in government borrowing and a one-standard error shock in private credit, which can be discerned by examining Figures 8 and 9 and Table (3). It appears that the effect of a government borrowing shock is highly contractionary on the level of overall credit extended from the banking sector, whether to the private sector or to the government. This means that a positive shock in the credit extended to the government would limit to a great extent the availability of banking sector credit in the future. In contrast, the effect of a private credit shock is slightly expansionary on the level of overall credit extended from the banking sector, whether to the private sector or to the government. This result is again consistent with a special version of the lazy banking hypothesis, where the effect of an increasing intake of government debt from part of the banking sector would limit to a great extent the overall credit emanating from the banking sector, which would adversely affect investment and hence overall growth potential in the future.

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#### IV. CONCLUSION AND POLICY RECOMMENDATIONS

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The possible crowding-out of private credit by government borrowing from the domestic banking sector and its negative effects on private investment are widely discussed in the literature, especially in the context of developing countries. However there is little or no credible empirical evidence. The aim of this paper is to test the lazy banking hypothesis for Egypt. This is quite relevant since Egypt has been relying heavily on debt-financing from the banking sector to finance its growing deficit. Using quarterly data spanning from the first quarter of 1970 until the second quarter of 2009, the paper estimates a Vector Autoregressive Model (VAR). The estimated coefficients together with the impulse response functions have produced a number of interesting results. First, there is a significant crowding-out effect of government borrowing from the domestic banks on private credit. This crowding-out effect comes from the endogenous response of the banking sector to increased government borrowing. The crowding-out effect was found to be more than one to one, which means that one pound "invested" in government debt

reduces the available credit to the private sector by more than one pound. Second, the willingness of the banking sector to increase their holdings of government debt increases when there is an increase in private credit, which reflects its desire to balance its portfolio right away after extending more private credit by holding relatively safer government debt. Third, evidence shows that output growth, which can be regarded as a proxy for macroeconomic fundamentals, positively impacts the willingness of the banking sector to extend more credit to both the government and the private sector albeit the increase in the latter is slightly less than the former. Fourth, estimation results show that private credit is an autoregressive process, indicating that as banks grant more credit to the private sector, more private credit is granted by more banks due to increased confidence and rising competition. Fifth, evidence from the impulse response functions show that shocks propagate over time, with higher fluctuations into the future, which is evidence of the inherent fragility of the banking sector. This result calls for more prudent policies and regulations from the central bank to limit the negative externalities coming from banks' sole motive of profit-maximization without much taking into account the effect of this motive on the health of the financial system and the macroeconomy in general. Finally, and consistent with the lazy bank model, impulse response functions show that the effect of a government borrowing shock is highly contractionary (as opposed to the effect of a private credit shock, which is slightly expansionary) with regard to the overall credit emanating from the banking sector. This implies that a positive shock in the credit extended to the government would limit to a great extent the availability of banking sector credit in the future.

In sum, the confirmation of the lazy bank hypothesis together with the growing government deficit financed mainly from the banking sector poses a number of momentous challenges in Egypt with short-run and long-run ramifications<sup>19</sup>. Besides the apparent adverse effect of the observed unsustainable government deficit, this paper has uncovered another serious channel coming from the financial sector, or more precisely the banking sector. As the government issues more debt instruments to finance its deficit, banks tempted by the risk-free high return motive shift their portfolio away from risky private loans and opt for lazy behavior characterized by a shrinking overall credit tilted more and more toward government debt-instruments. This behavior not only limits their exposure toward the private sector, hence reducing private investment, but also affects adversely investment and hence overall growth potential in the future. Also, from the banking sector perspective, although lending to the government has a positive impact on banks' profitability, it distorts banks' incentives and the process of financial deepening since banks earning relatively risk-free returns from the government have little incentive to develop the banking market. This double-edged sword is fatal to the stance of the economy, especially in a period of rather gradual economic recovery.

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<sup>19</sup> In light of the recent budget constraints caused by the political uprising, it is also of the upmost importance to explore which portfolio of public expenditure generates economic growth in Egypt. Public investment spending could be significant for Egypt. A number of studies document the complementarity between public investment and private investment. Assessing the real impact and the complementarity effects of public investment on private investment in Egypt could be an area of future research.

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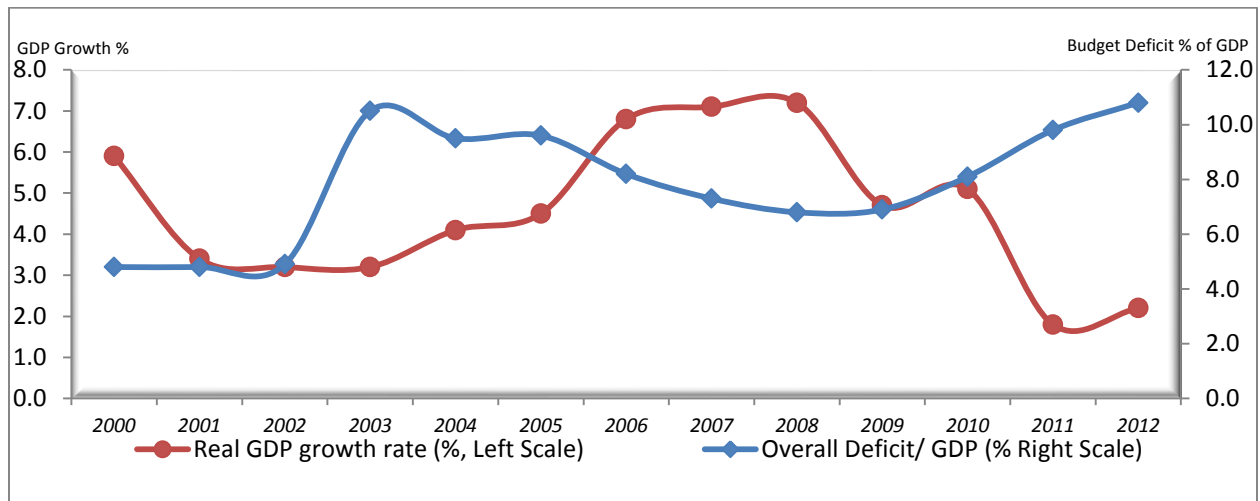
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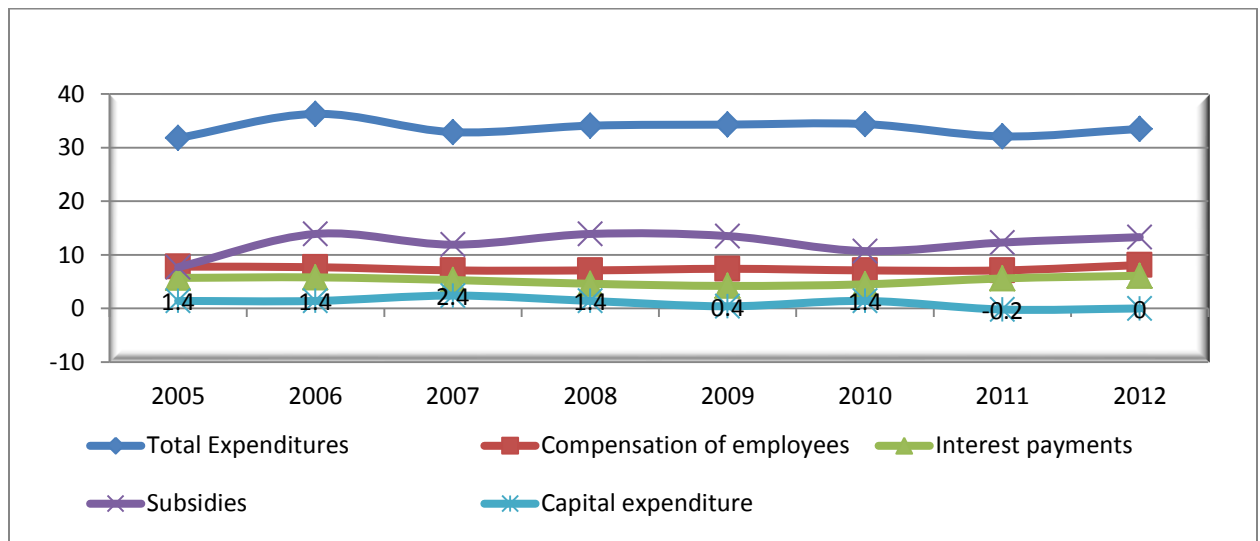
## Tables and Graphs

**Figure 1: Evolution of GDP Growth Rate and Budget Deficit as % of GDP**



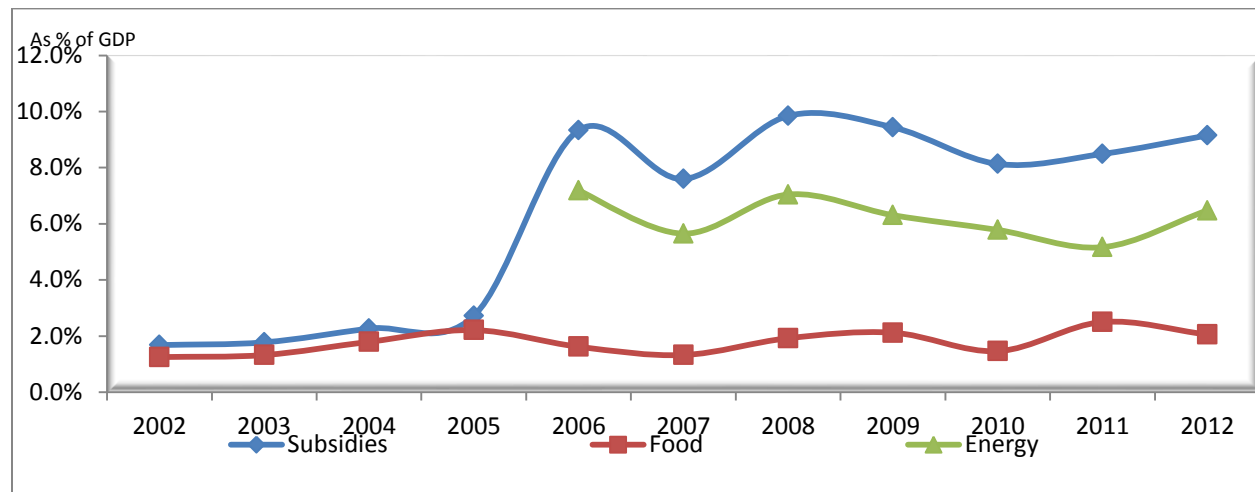
Source: AfDB based on data of the Central Bank of Egypt

**Figure 2: Components of Public Spending as a % of GDP**



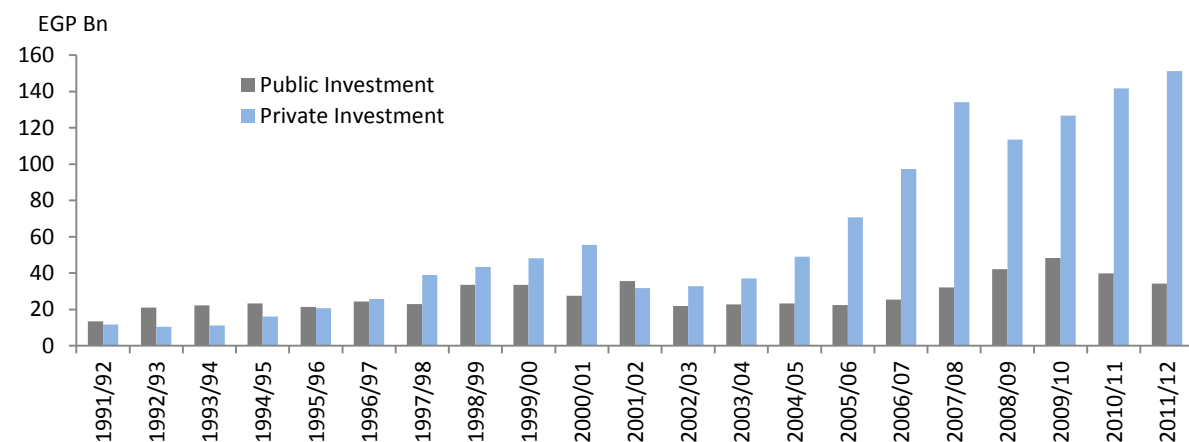
Source: AfDB based on data of the Ministry of Finance

**Figure 3: Subsidies as % of GDP**



Source: AfDB based on data of the Central Bank of Egypt

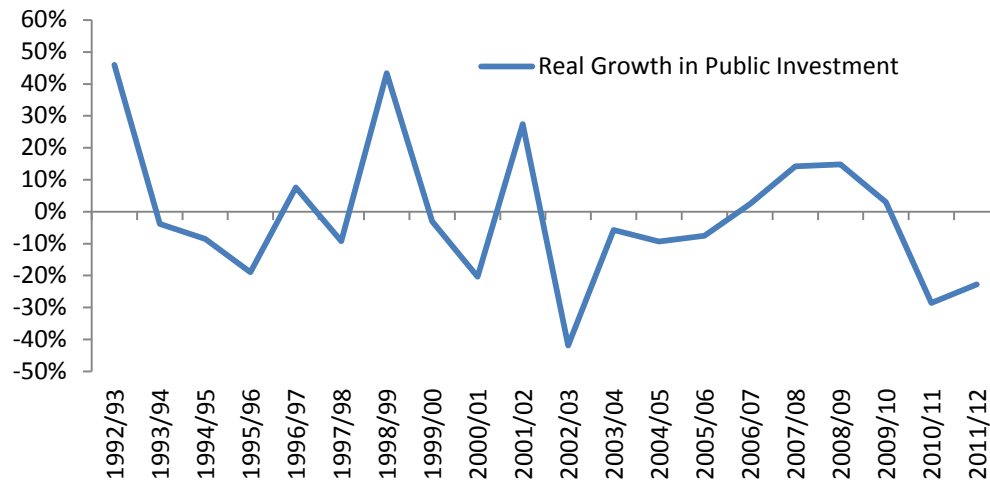
**Figure 4: Development of Public and Private Investment**



Source: AfDB based on data of Ministry of Planning

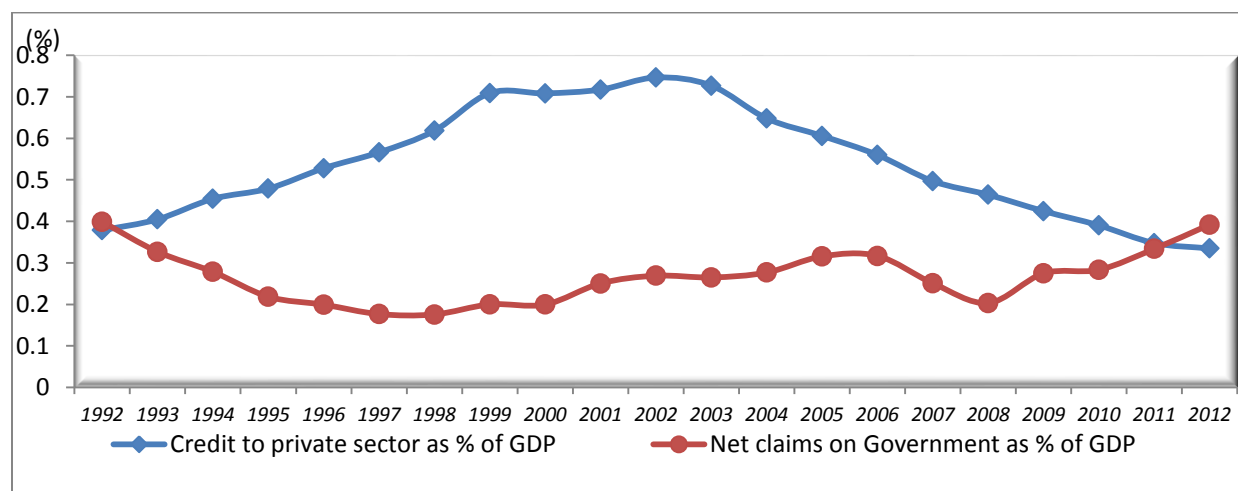


**Figure 5: Real Growth in Public Investment**



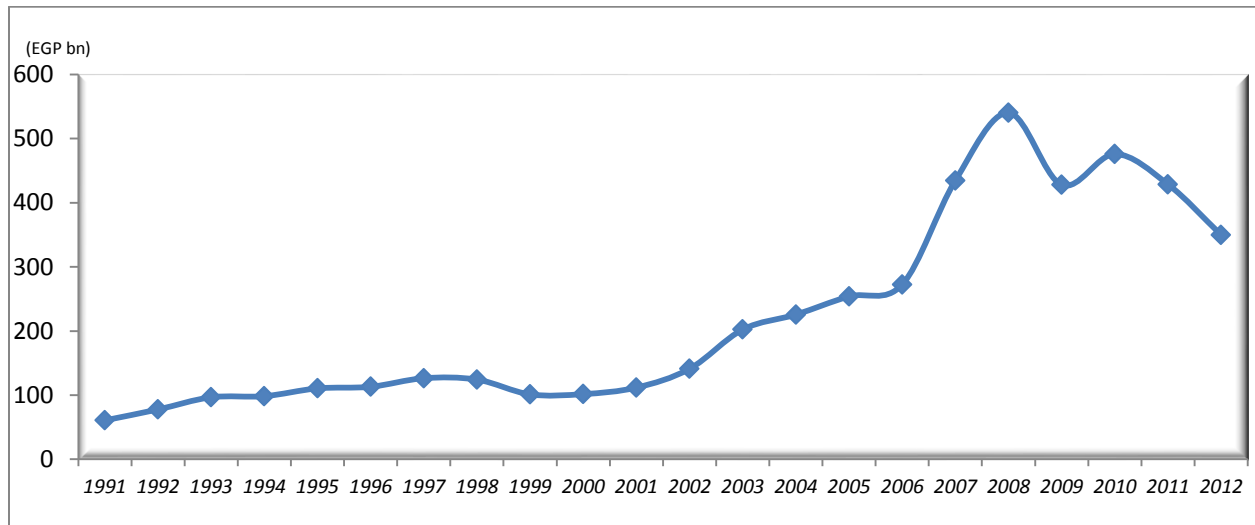
Source: AfDB based on data of the Central Bank of Egypt and Ministry of Finance

**Figure 6: Domestic Credit as a % of GDP**



Source: AfDB based on data of the Central Bank of Egypt and Ministry of Finance

**Figure 7: Difference between Lending capacity and total credit (EGP bn)**



Source: AfDB calculations based on data of the Central Bank of Egypt

Figure 8

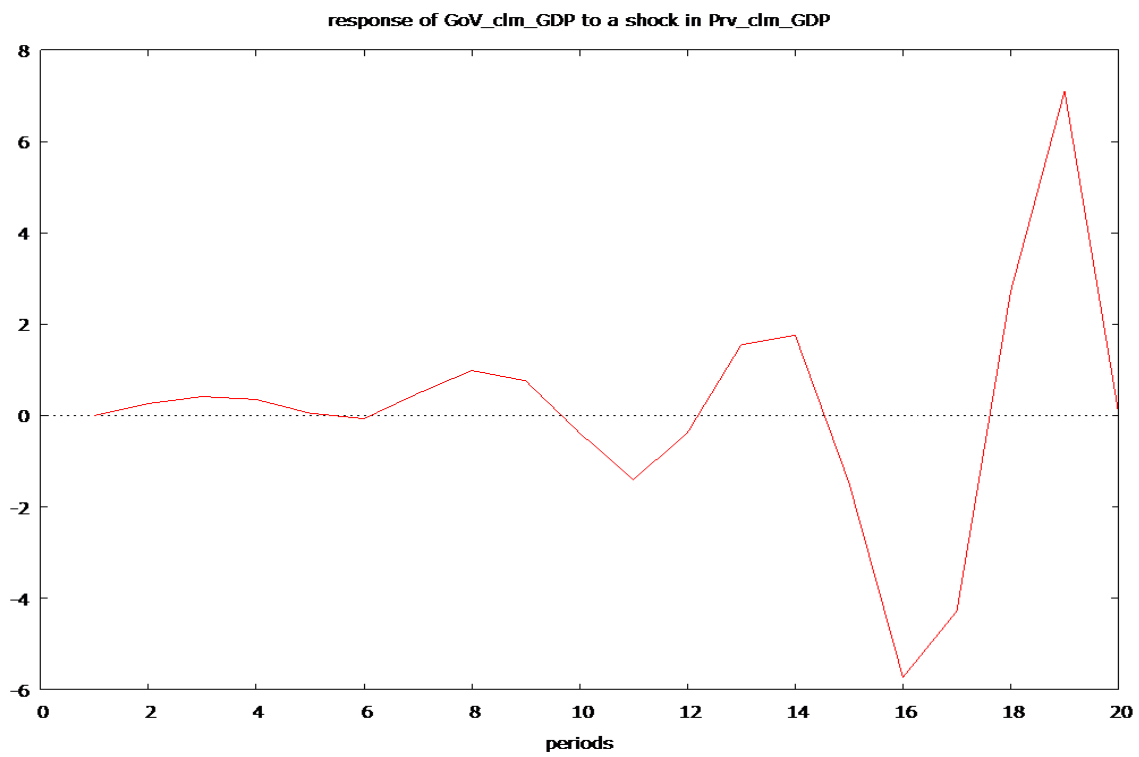
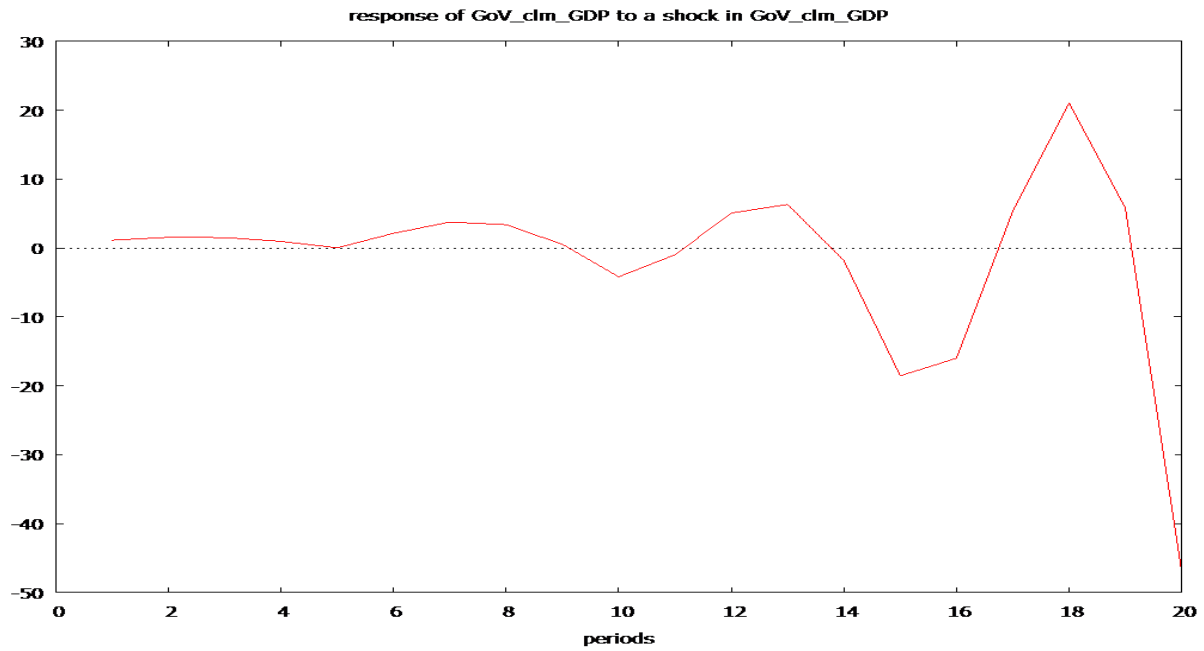
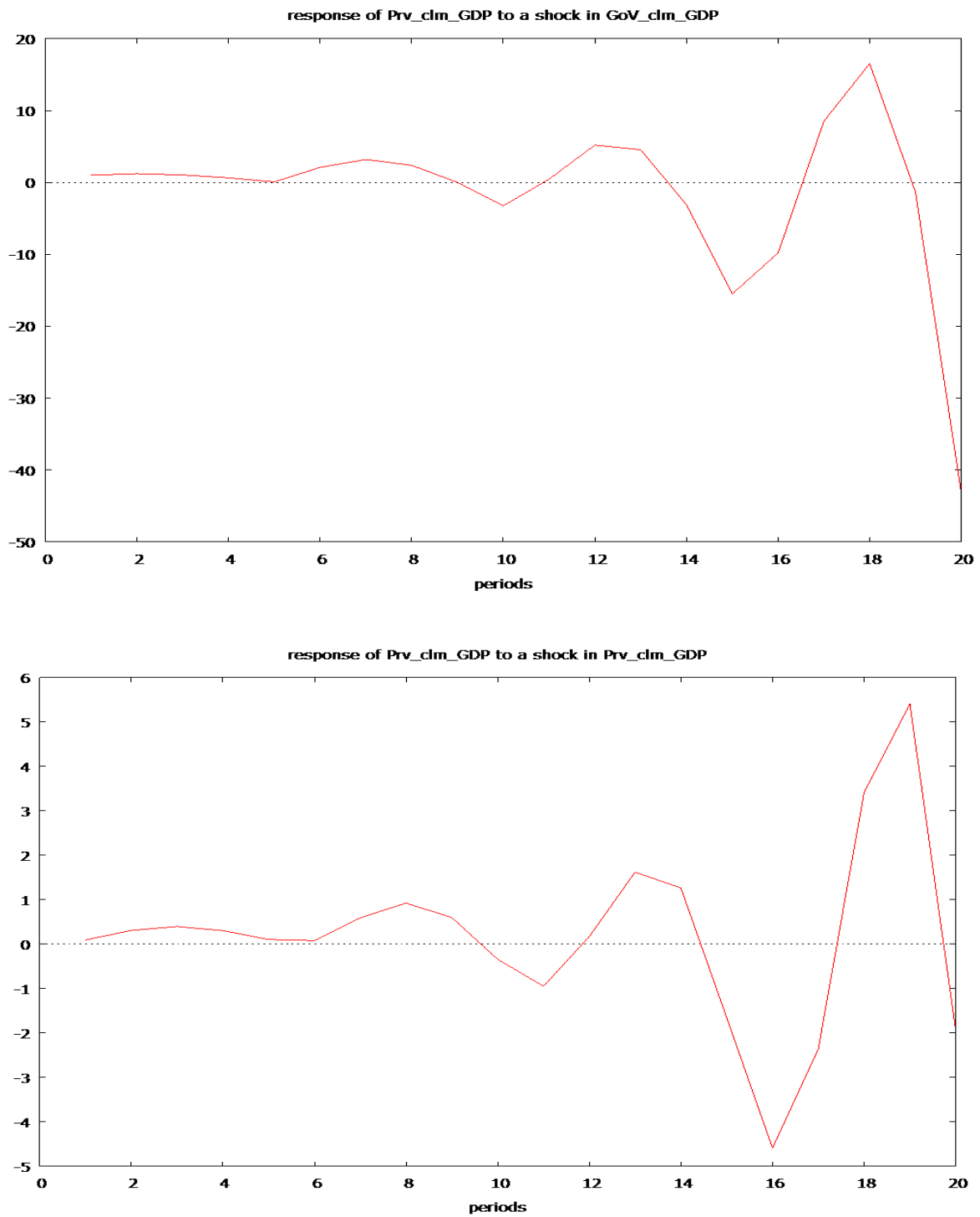


Figure 9



**Table 1: Stationary Test**

Augmented Dickey-Fuller test is based on estimating the following model:

$$(1 - L)y = b_0 + (a - 1) * y_{t-1} + \dots + e$$

Unit-root null hypothesis ( $H_0$ ):  $a = 1$

Variable	$\widehat{a - 1}$	Test-statistic	P-value	Result
GB	-0.3522	-4.4420	0.0001	Reject $H_0$
PC	-0.4016	-4.7926	0.0000	Reject $H_0$
GO	-1.5001	-11.8615	0.0000	Reject $H_0$

Maximum lag order for both GB and PC were 3 whereas it was 2 for GO.

**Table 2: VAR Results**

Variable <sup>20</sup>	Equation 1 (GB)	Equation 2 (PC)
$C$	0.419 (0.0616)*	0.3728(0.0657)*
$GB_{t-1}$	-1.126 (0.2189)	-1.8364(0.0274)**
$GB_{t-2}$	1.256(0.2826)	1.0873(0.3029)
$GB_{t-3}$	1.0298(0.3349)	0.9230(0.3386)
$GB_{t-4}$	0.6641(0.4896)	0.2732(0.7527)
$GB_{t-5}$	0.7038(0.4616)	0.9084(0.2931)
$GB_{t-6}$	-1.8156(0.0194)**	-1.5776(0.0244)**
$PC_{t-1}$	2.7849(0.020)**	3.2588(0.0028)**
$PC_{t-2}$	-1.5668(0.2483)	-1.3300(0.2777)
$PC_{t-3}$	-1.3930(0.2741)	-1.0478(0.3619)
$PC_{t-4}$	-1.5545(0.1861)	-0.9394(0.3754)
$PC_{t-5}$	1.6921(0.1527)	1.0727(0.3145)
$PC_{t-6}$	-0.1887(0.8543)	-0.23875(0.7970)
$GO_{t-1}$	3.2953(0.1955)	2.3553(0.3049)
$GO_{t-2}$	0.13441(0.9590)	-0.0962(0.9675)
$GO_{t-3}$	3.4005(0.1398)	3.2669(0.1165)
$GO_{t-4}$	-1.3059(0.5732)	-0.4781(0.8193)
$GO_{t-5}$	8.6779(0.0003)***	7.9010(0.0003)***
$GO_{t-6}$	-0.23526(0.6125)	-0.2384(0.5699)
	<b>R<sup>2</sup>=0.668</b>	<b>R<sup>2</sup>=0.618</b>
	<b>Adj-R<sup>2</sup>=0.622</b>	<b>Adj-R<sup>2</sup>=0.566</b>
	<b>F<sub>stat</sub>=14.737(0.00)***</b>	<b>F<sub>stat</sub>=11.871 (0.00)***</b>
	<b>D-W<sub>stat</sub>=1.975</b>	<b>D-W<sub>stat</sub>=1.971</b>

P-value is in parenthesis, \*, \*\*, and \*\*\* denote significant at the 10%, 5% and 1% respectively

<sup>20</sup> The F-stat for zero restrictions was rejected at the 1% level for all the variables for all lags and for all lags for each variable.

**Table 3: Effects of Shocks**

Responses to a one-standard error shock in GB

period	GB	PC
1	1.1353	1.0208
2	1.5644	1.2418
3	1.523	1.0504
4	0.9767	0.65398
5	0.036653	0.090461
6	2.1527	2.112
7	3.7835	3.2129
8	3.4	2.3911
9	0.53749	0.023303
10	-4.1674	-3.2314
11	-0.97409	0.46601
12	5.0778	5.2117
13	6.3362	4.562
14	-1.8214	-3.0917
15	-18.532	-15.492
16	-15.999	-9.8009
17	5.3398	8.5301
18	21.073	16.56
19	5.805	-1.3359
20	-46.876	-43.142

Responses to a one-standard error shock in PC

period	GB	PC
1	0	0.095129
2	0.26492	0.31
3	0.41594	0.3972
4	0.35227	0.3066
5	0.050358	0.10656
6	-0.067863	0.080963
7	0.48567	0.59638
8	0.98794	0.92515
9	0.76122	0.59955
10	-0.37947	-0.34052
11	-1.4025	-0.94729
12	-0.37628	0.17282
13	1.5512	1.6218
14	1.7609	1.2668
15	-1.4732	-1.6515
16	-5.7306	-4.5899
17	-4.2813	-2.3583
18	2.7176	3.4138
19	7.1065	5.4088
20	0.063224	-1.9348